Preconditions and assumptions for large scale utilisation of wind energy

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Large scale Utilization of Wind Power

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Preconditions and Assumptions

Photos:

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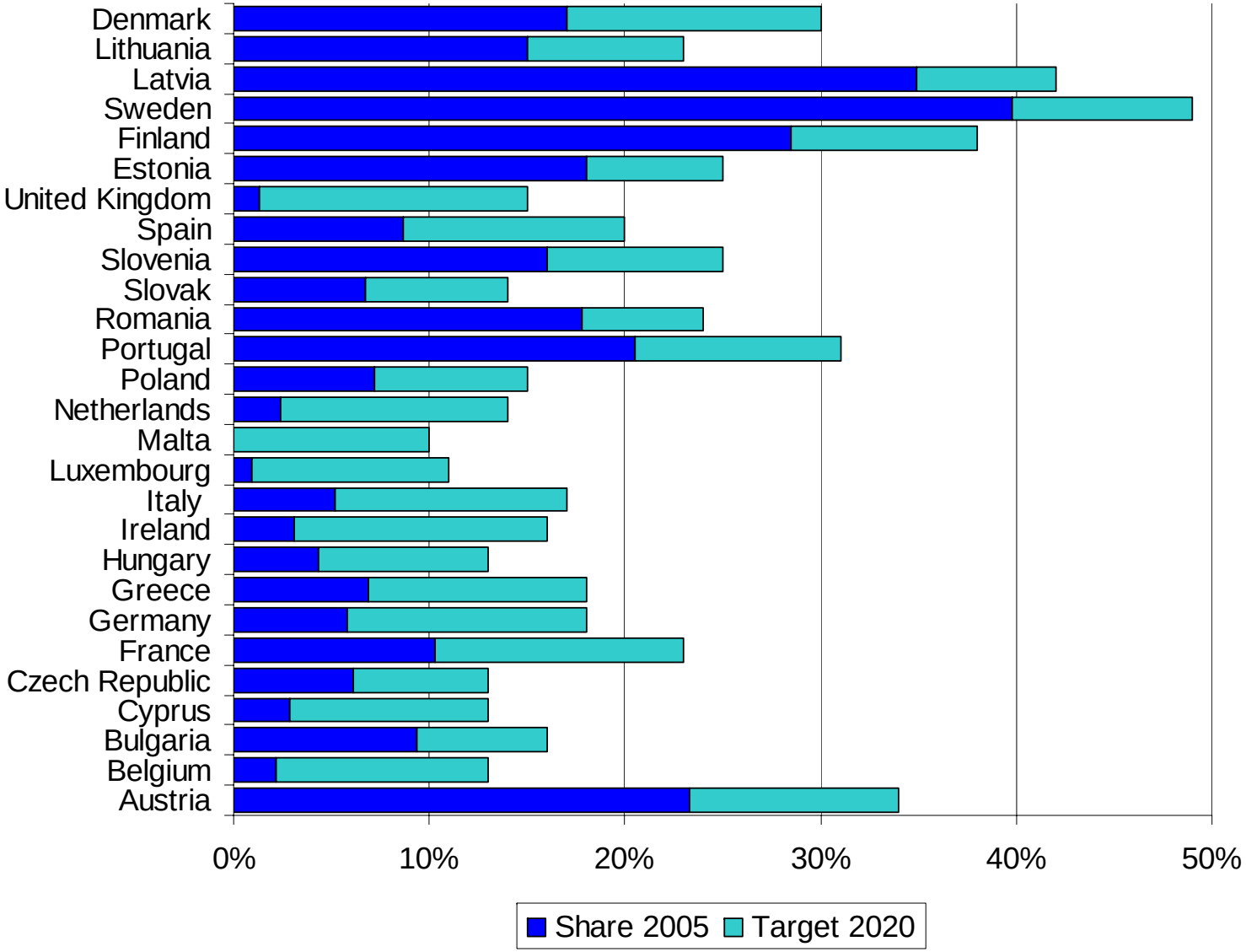
Risø DTU

The Scene is Set

EU Targets in place: 20 – 20 – 20 by 2020

- EU ETS is approved
  - Emissions of Greenhouse gases to be reduced by 20% compared to 1990
- EU Renewables Directive is approved
  - 20% of Final Energy Consumption to be supplied by Renewables and Wind Power will be an important contributor
- 20% Energy Conservation by 2020
- 10% of Transport fuels have to be supplied by Renewables

National RES Target



Future Challenges

Medium term

- Volatility in prices might be a barrier towards future investments
- Delaying the necessary process towards a sustainable energy system

Longer term

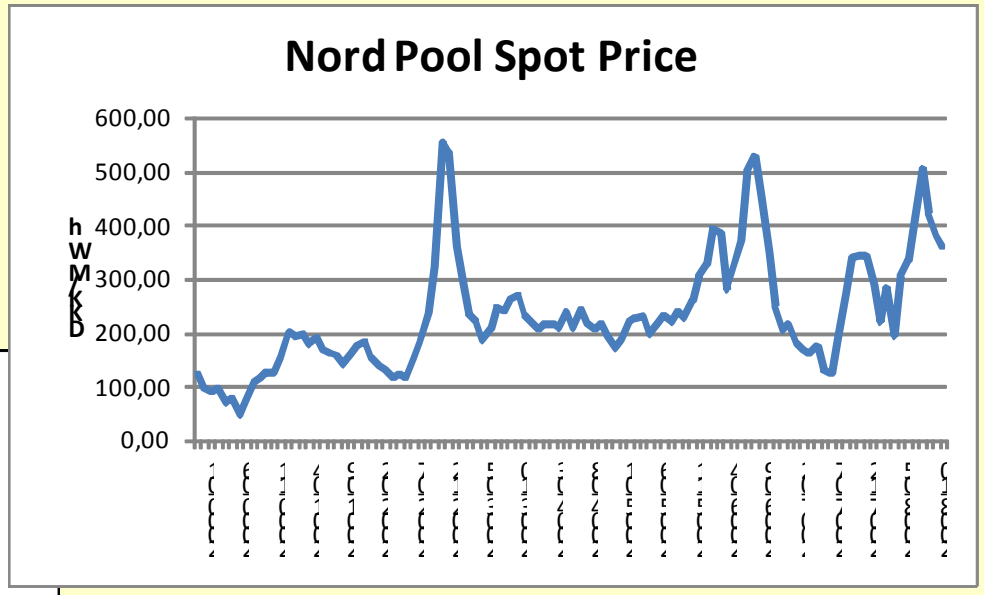
- Integration of Wind Power into the energy system is a pressing matter
- Do we have the right market set up?

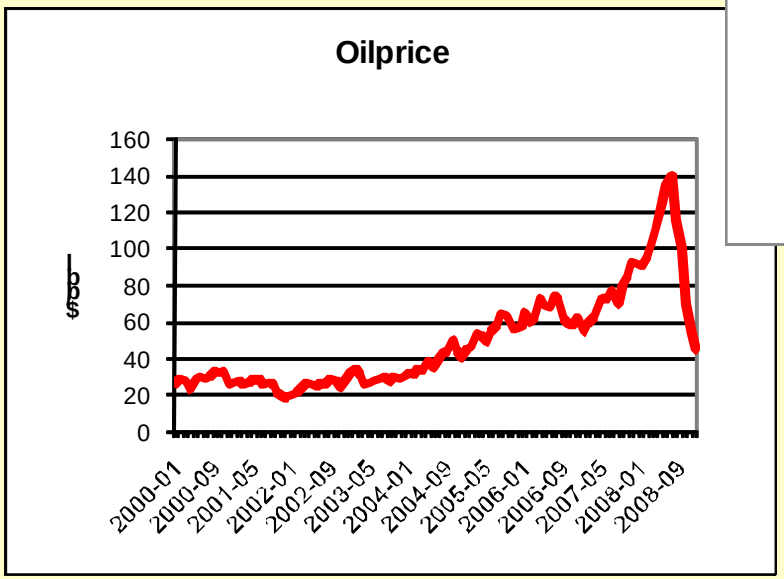
Future Support System

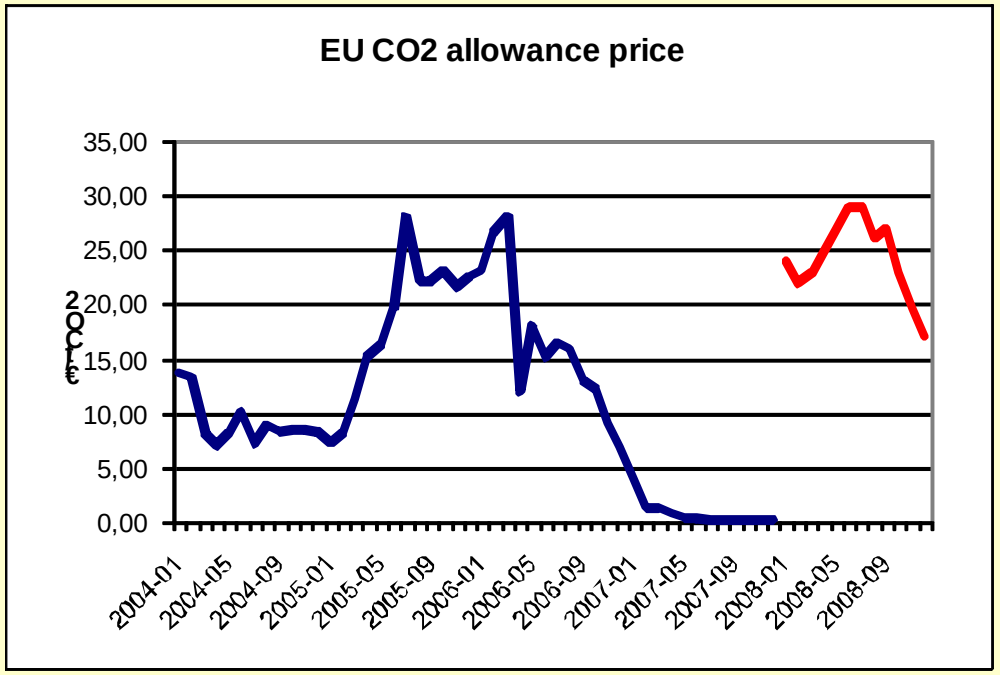
- **Feed-in tariff and Large Scale deployment of Wind Power does not go well together**
  - In Denmark 20% of power production should be taken out of the market

- **A Market Compatible System is needed**
  - Premium System: Spot Price plus an adder
  - Green Certificate System could also do the job, if defined for a large geographical area

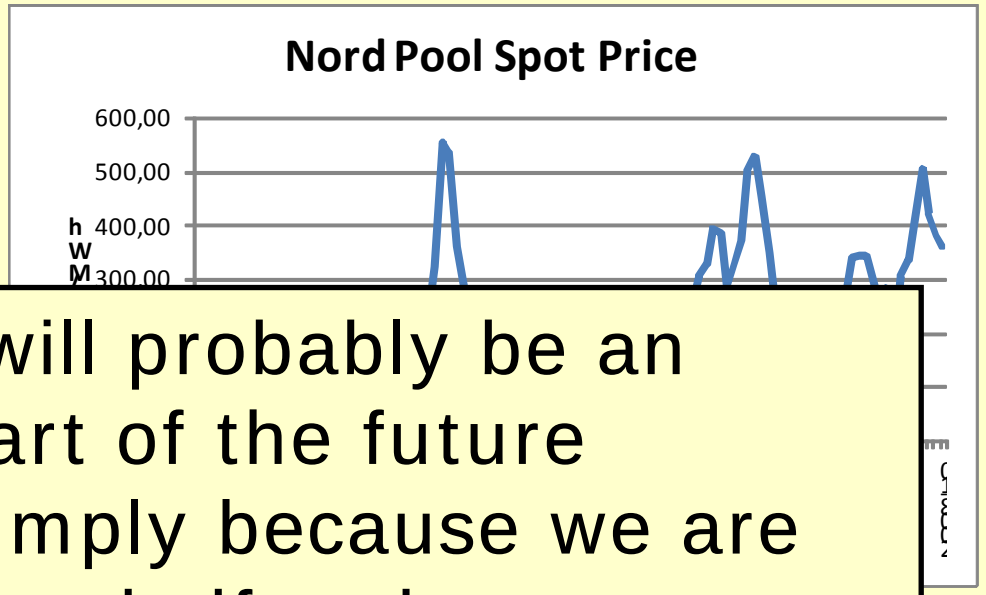
Prices

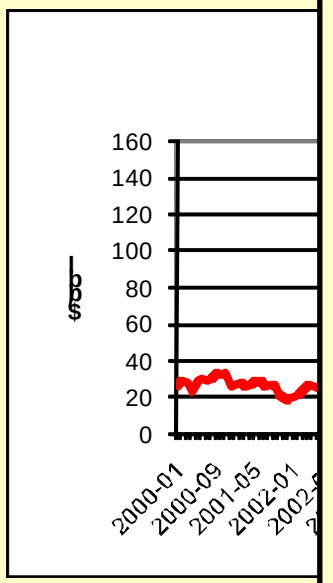

Nord Pool Spot Price
600,00
500,00
400,00
300,00
200,00
100,00
0,00

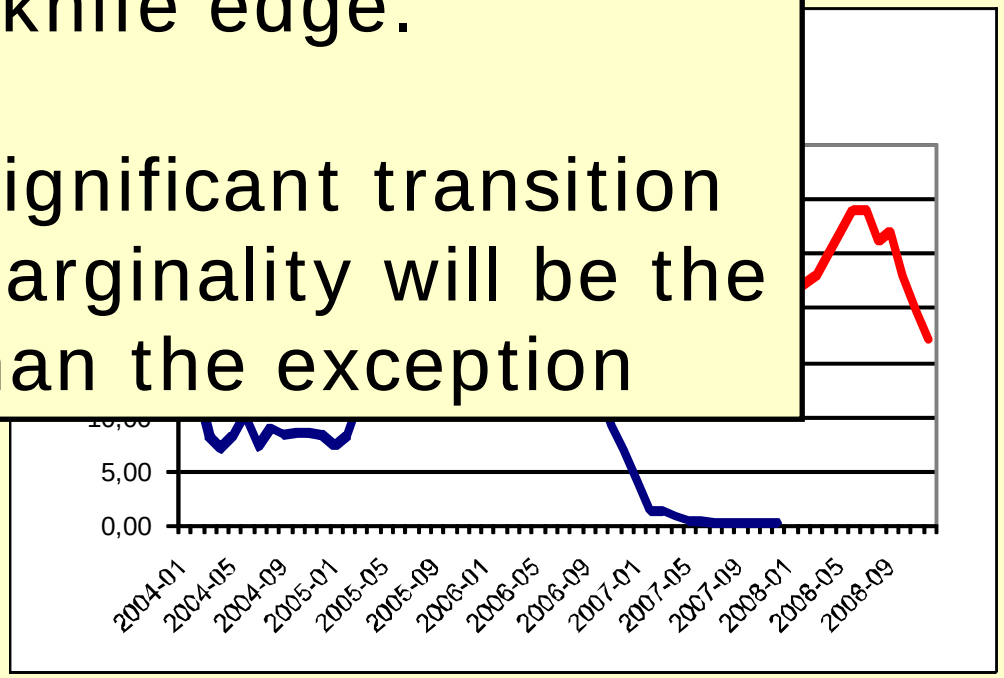

Oilprice
160
140
120
100
80
60
40
20
0
2000-01
2000-09
2001-05
2002-01
2002-09
2003-05
2004-01
2004-09
2005-05
2006-01
2006-09
2007-05
2008-01
2008-09


EU CO2 allowance price
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
2004-01
2004-05
2004-09
2005-01
2005-05
2005-09
2006-01
2006-05
2006-09
2007-01
2007-05
2007-09
2008-01
2008-05
2008-09

Prices



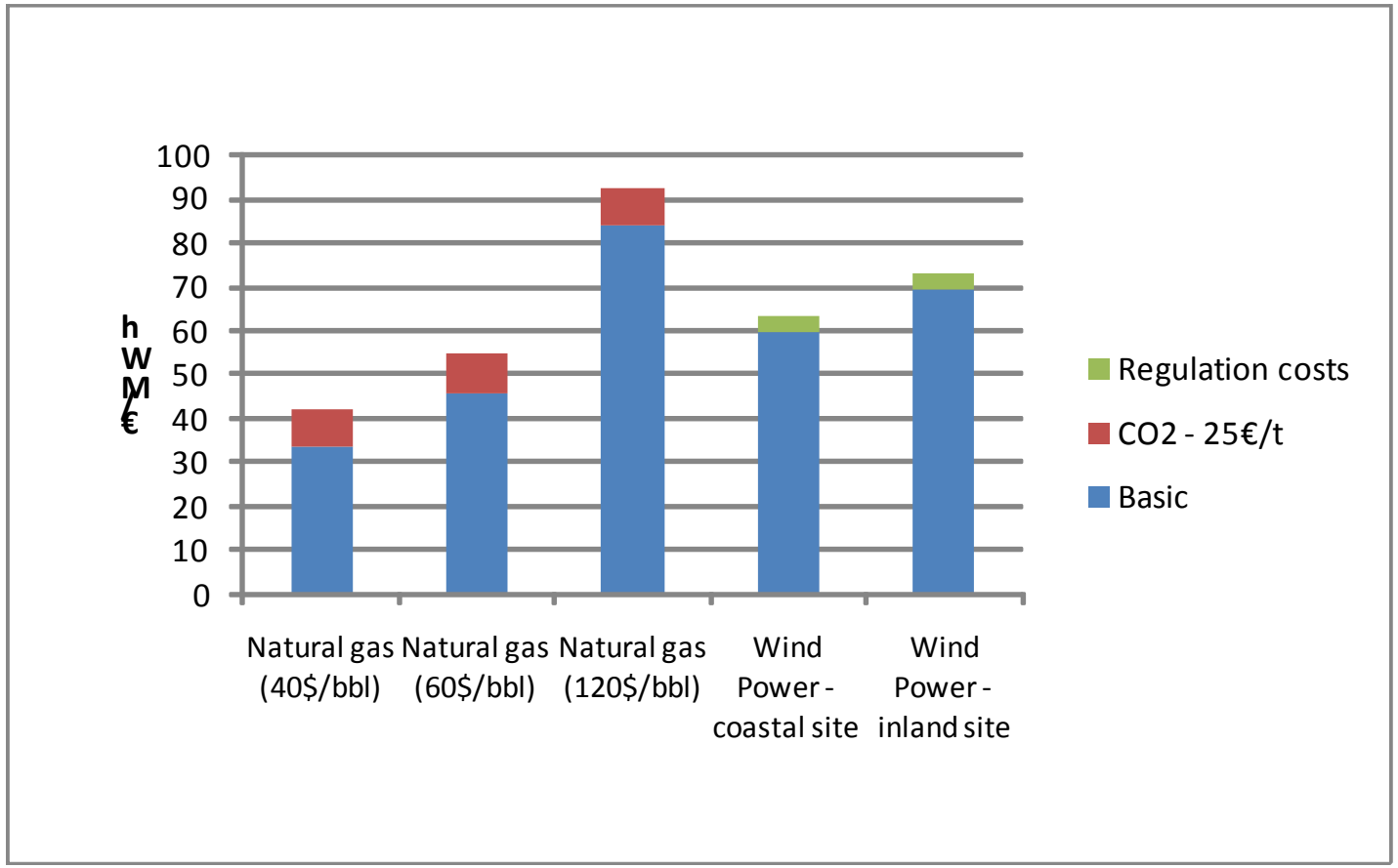




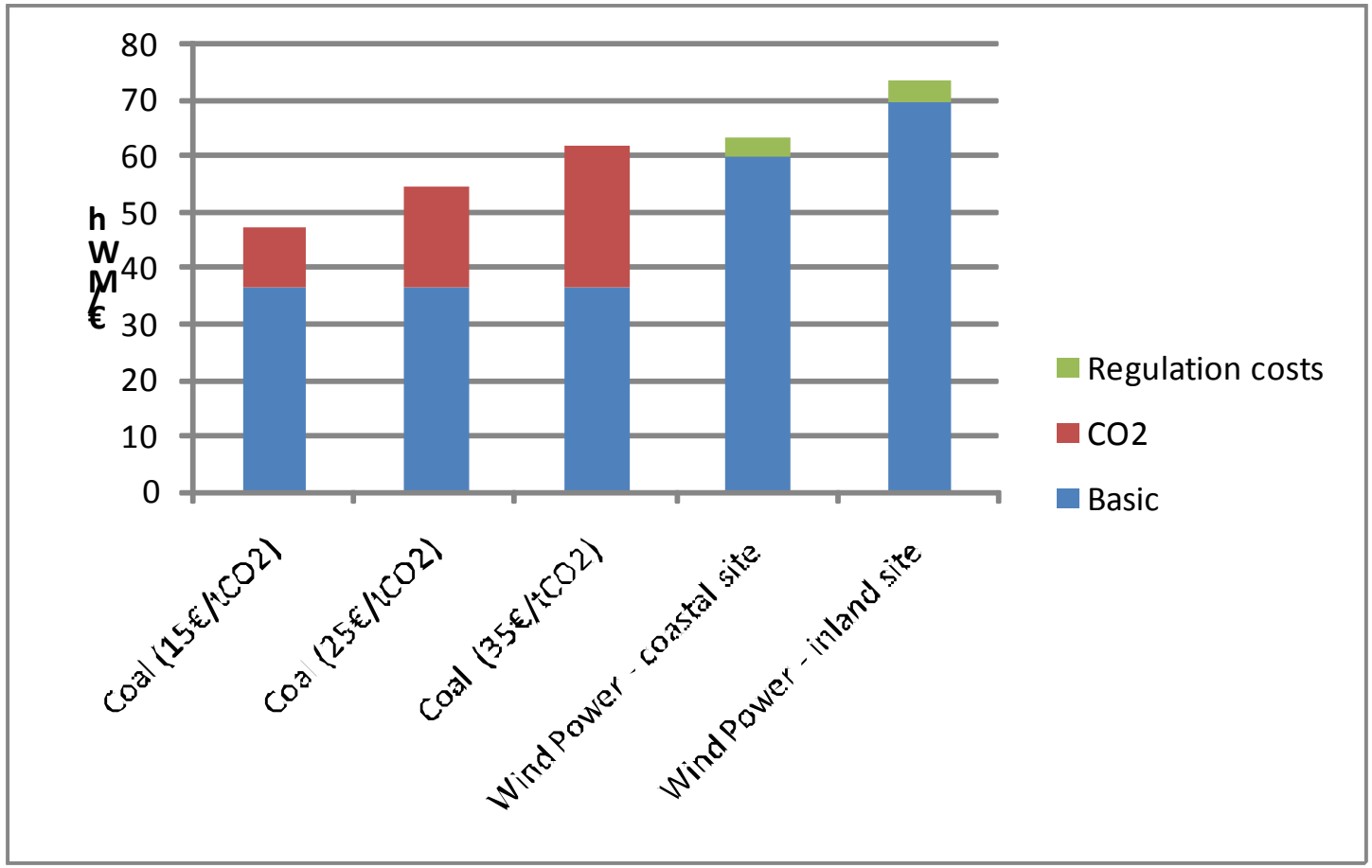
Volatility will probably be an integral part of the future system, simply because we are moving on a knife edge.

We are in a significant transition period and marginality will be the rule rather than the exception

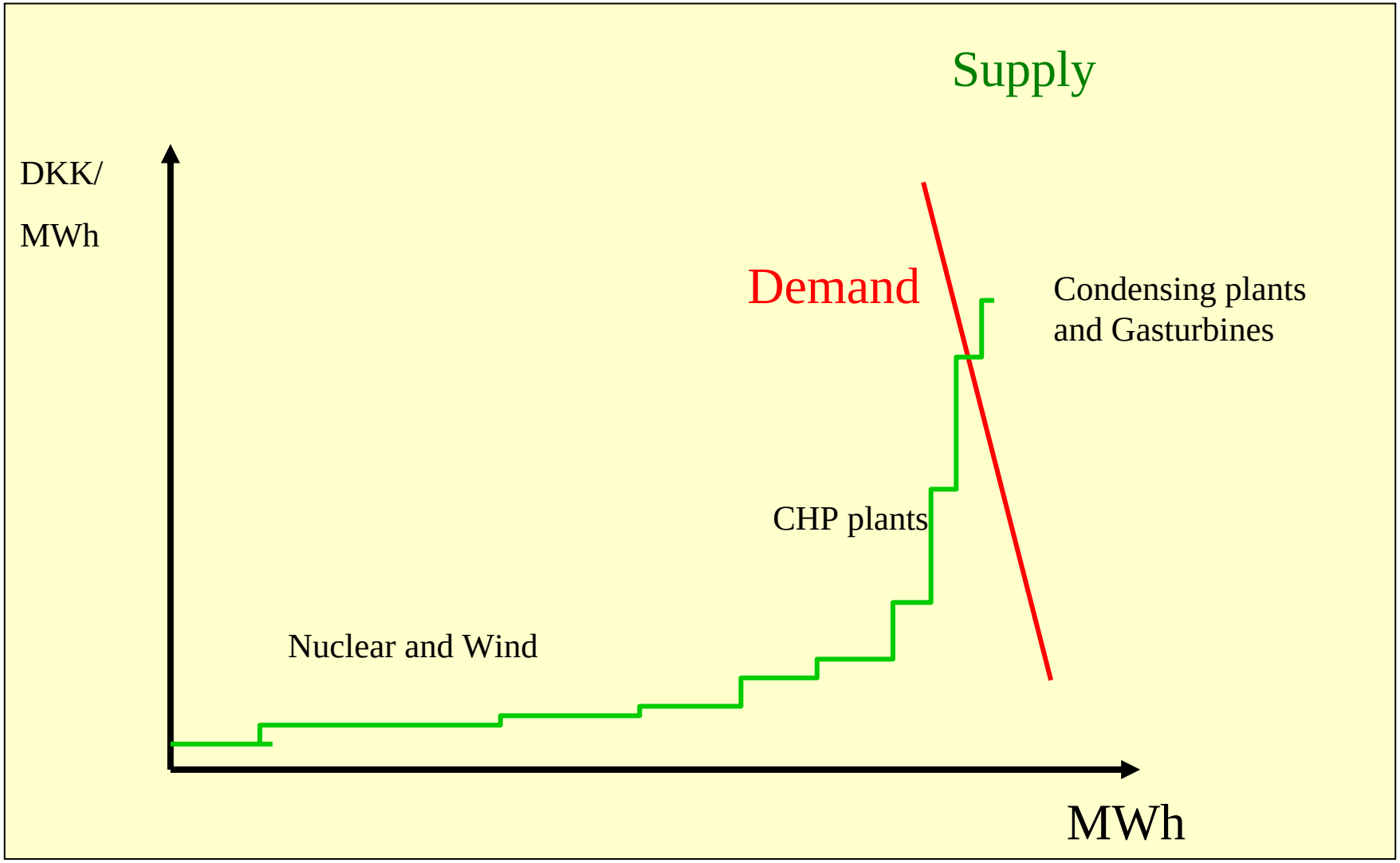
Wind Power Compared to Natural Gas Power Plant



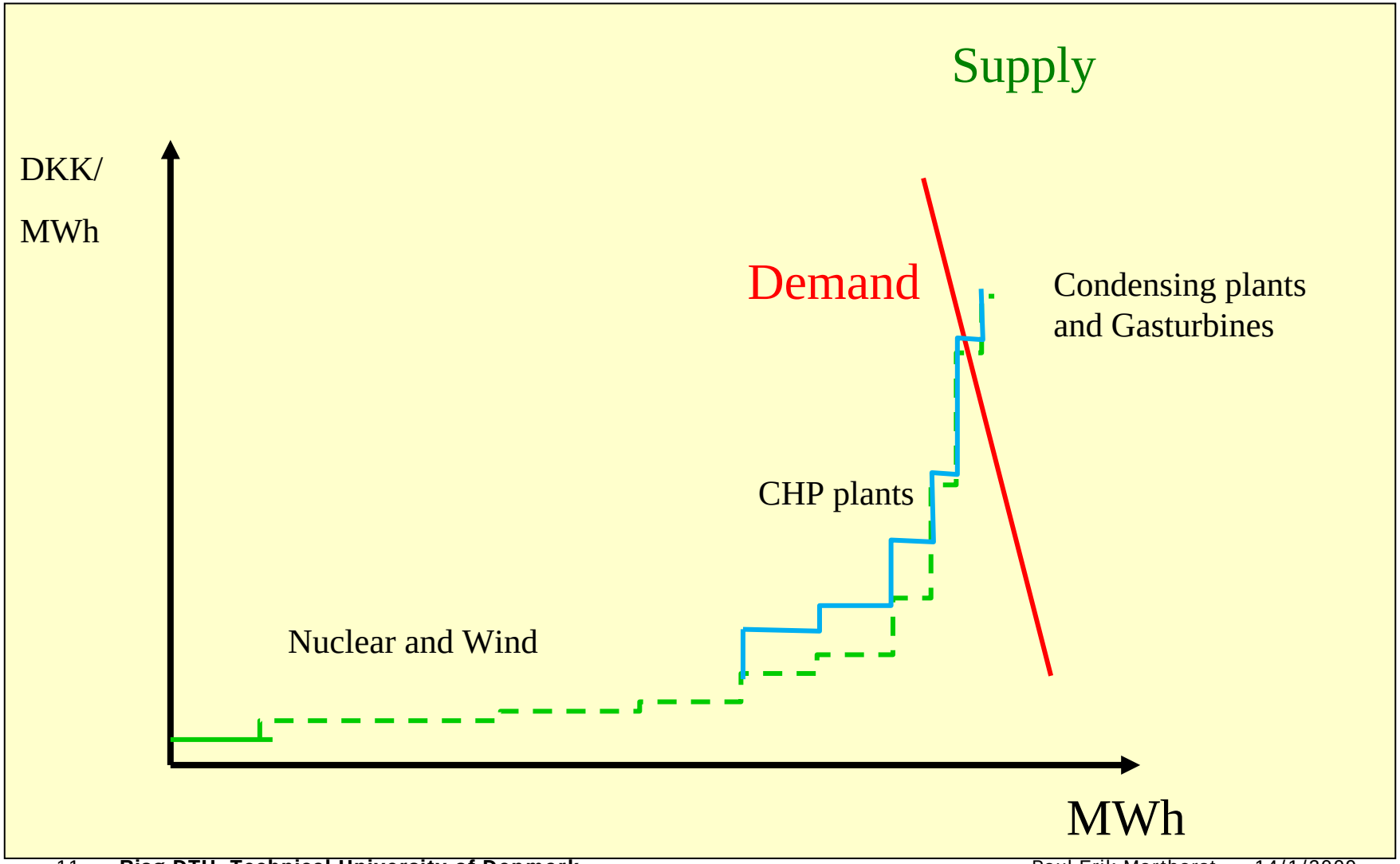
Wind Power Compared to Coal Fired Power Plant



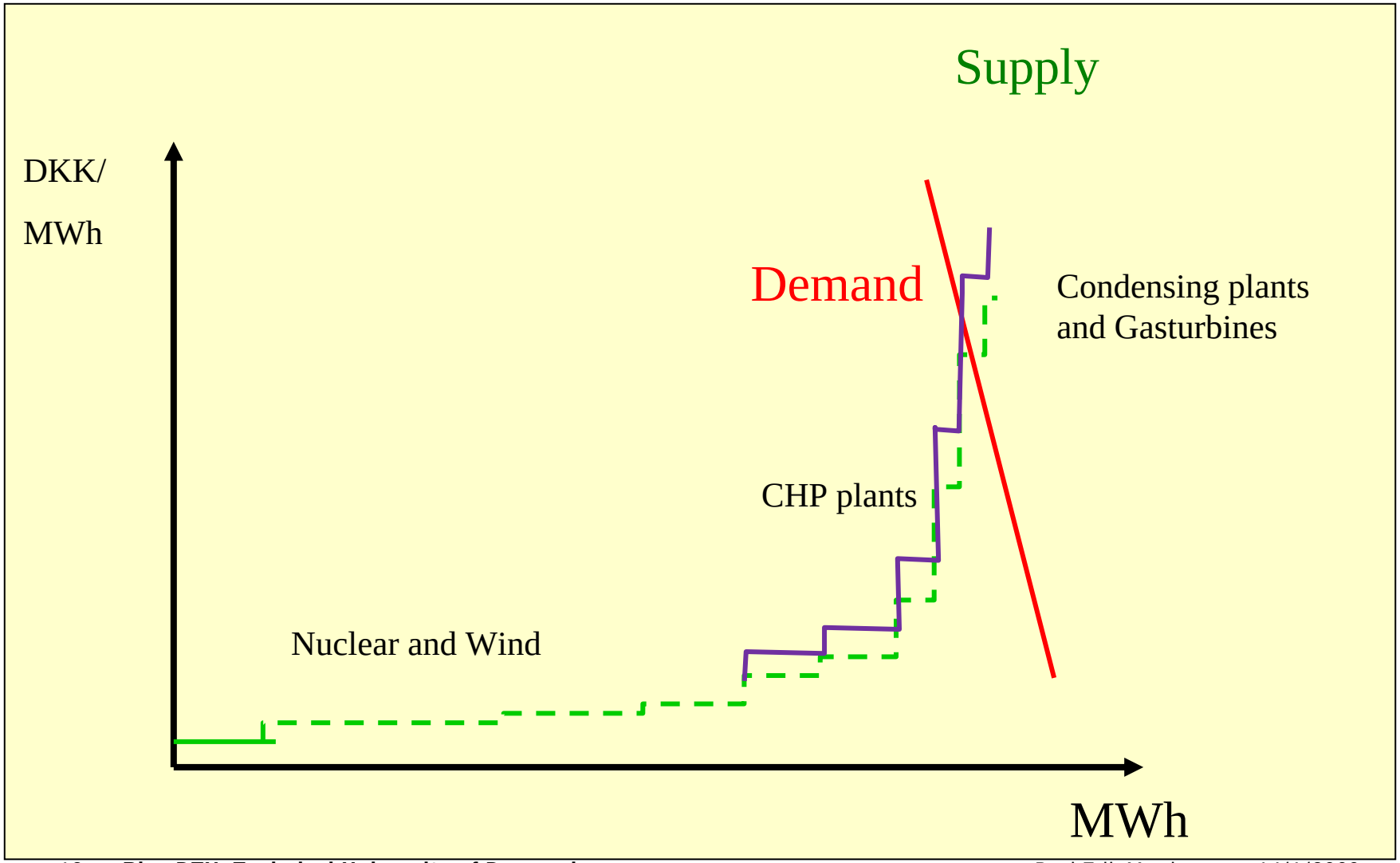
Determination of the Power Price



The Consequence of CO2 on Power Price



The Consequence of Fuel price increase on Power Price

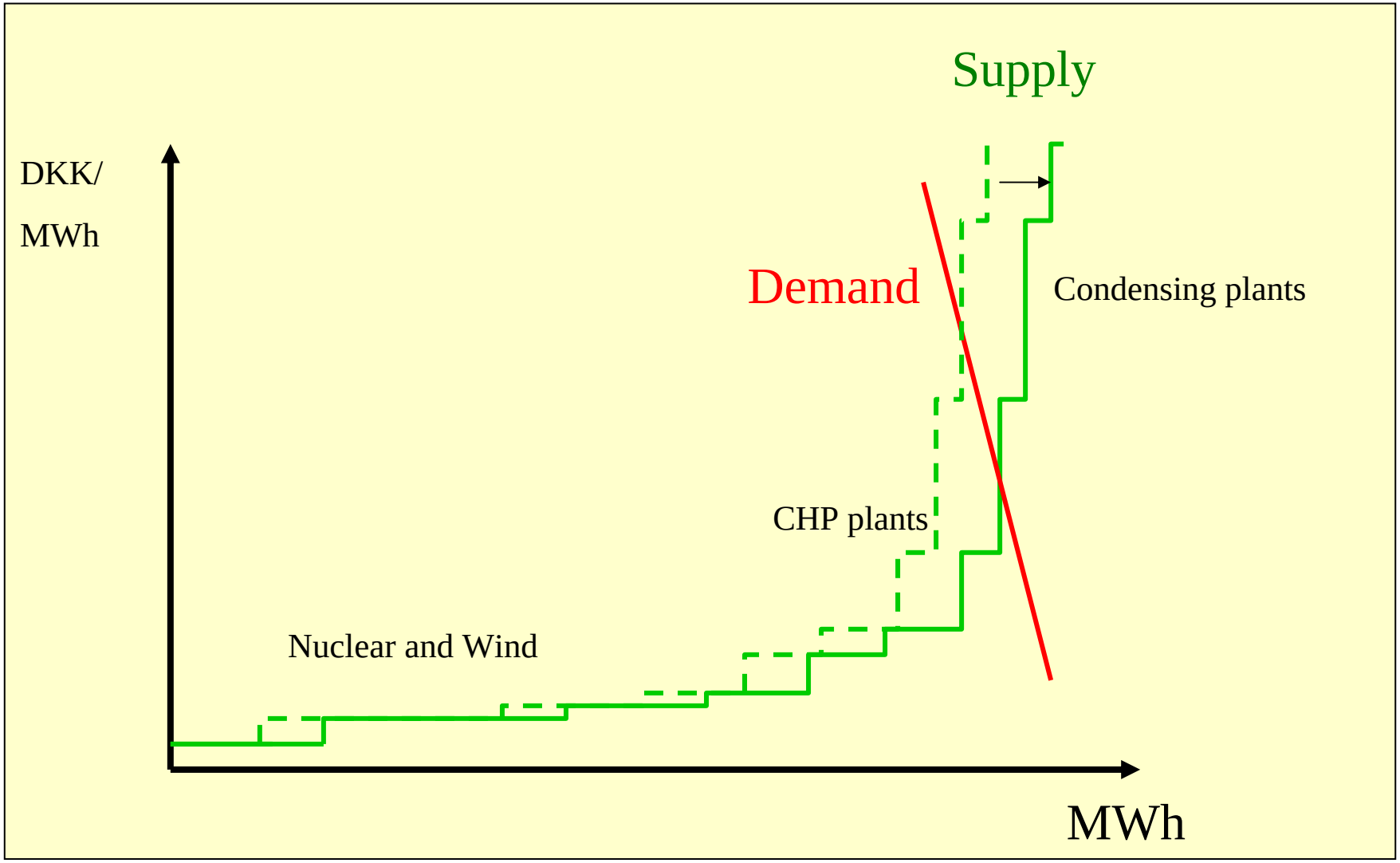


Where are we now?

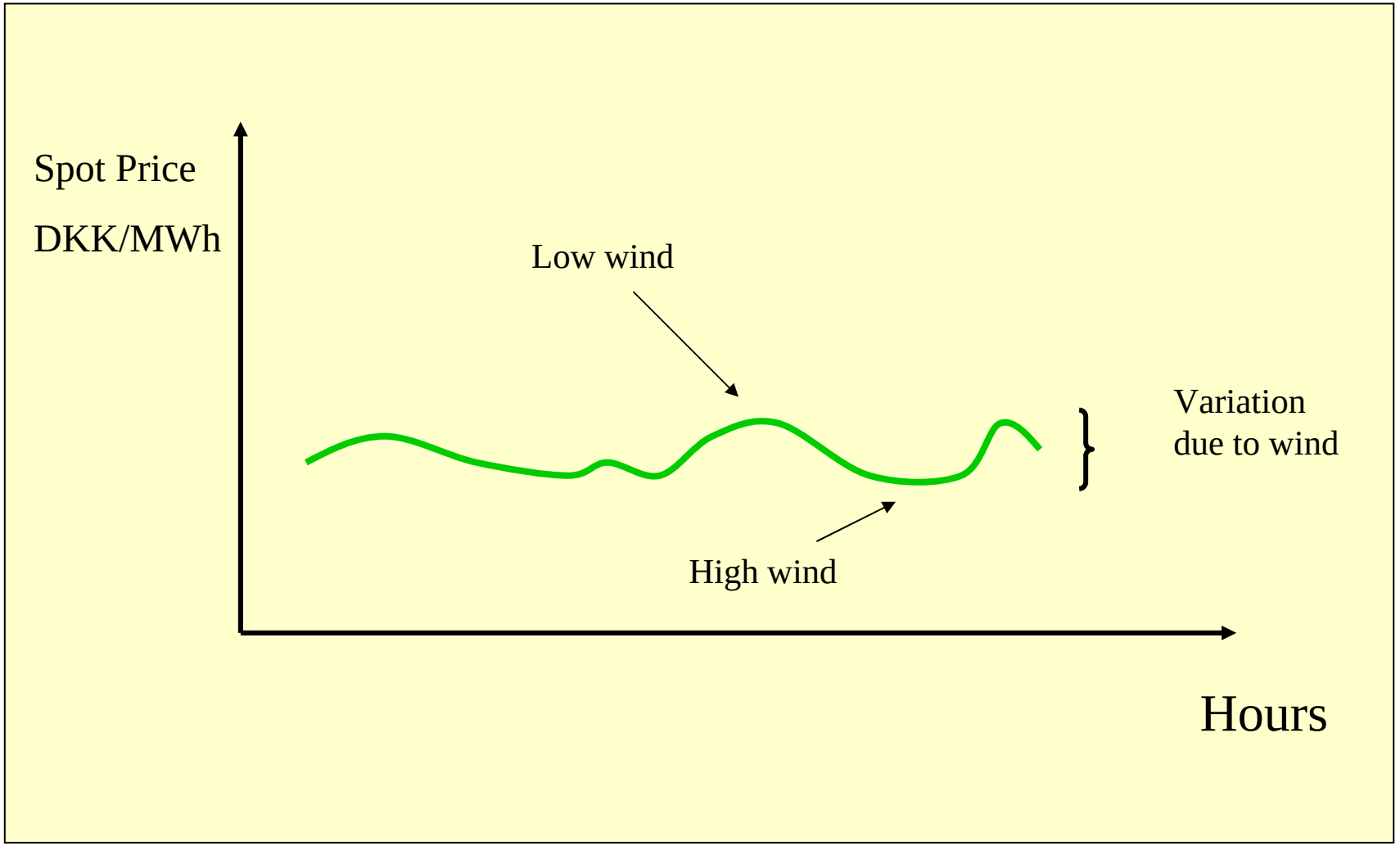
- **Price volatility increases the risk for investors**
  - Wind Power constitutes a firm component in the Power Industries' portefolio
  - However low fuel prices might imply losses for wind power investments

- **ETS market will not by itself generate the needed economic incentives for large scale deployment of wind power**
  - Specific support schemes are needed
  - The closer we relate support to the power market price the higher will be the required risk premium to investors

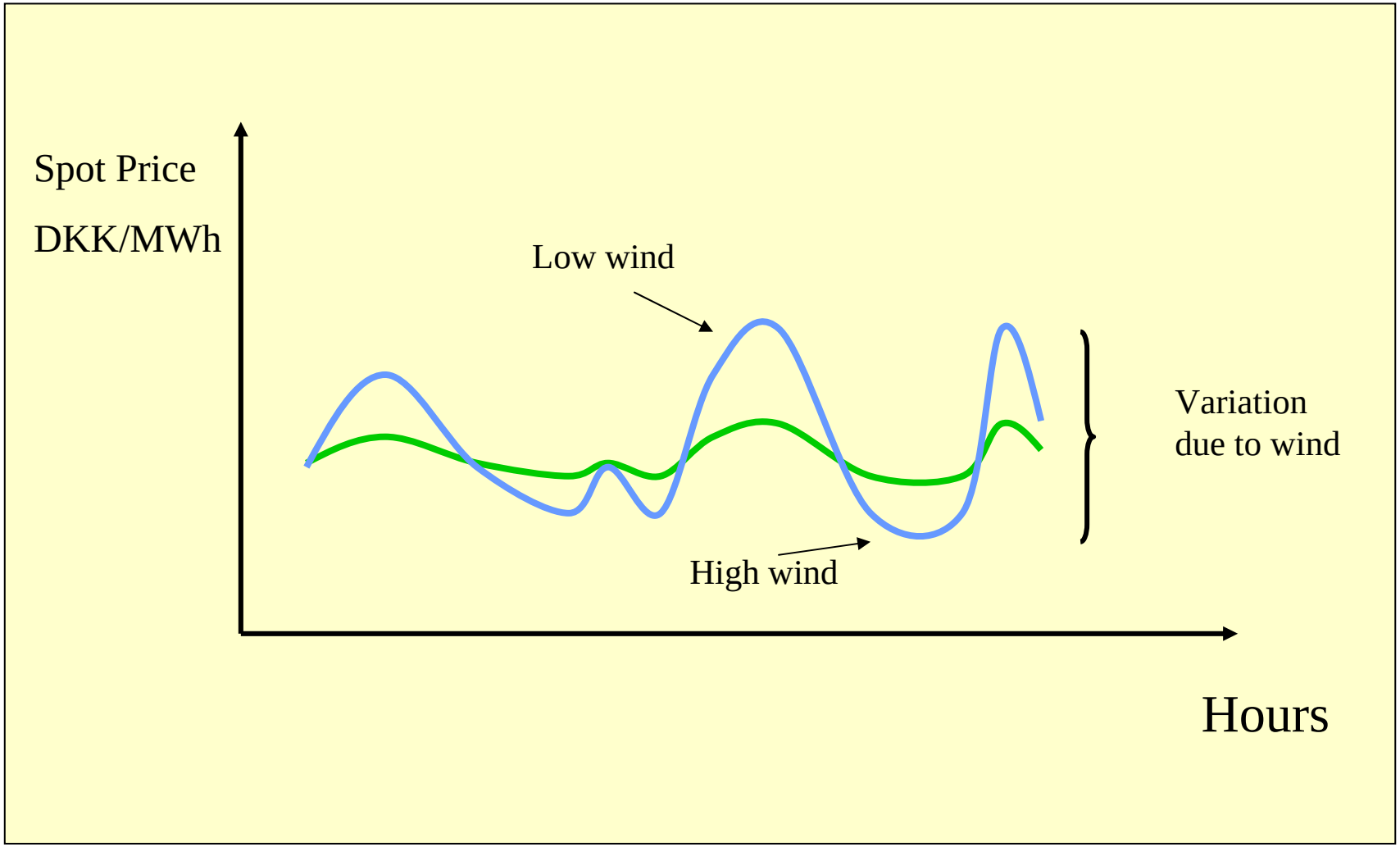
Determination of the Power Price, when the wind is high



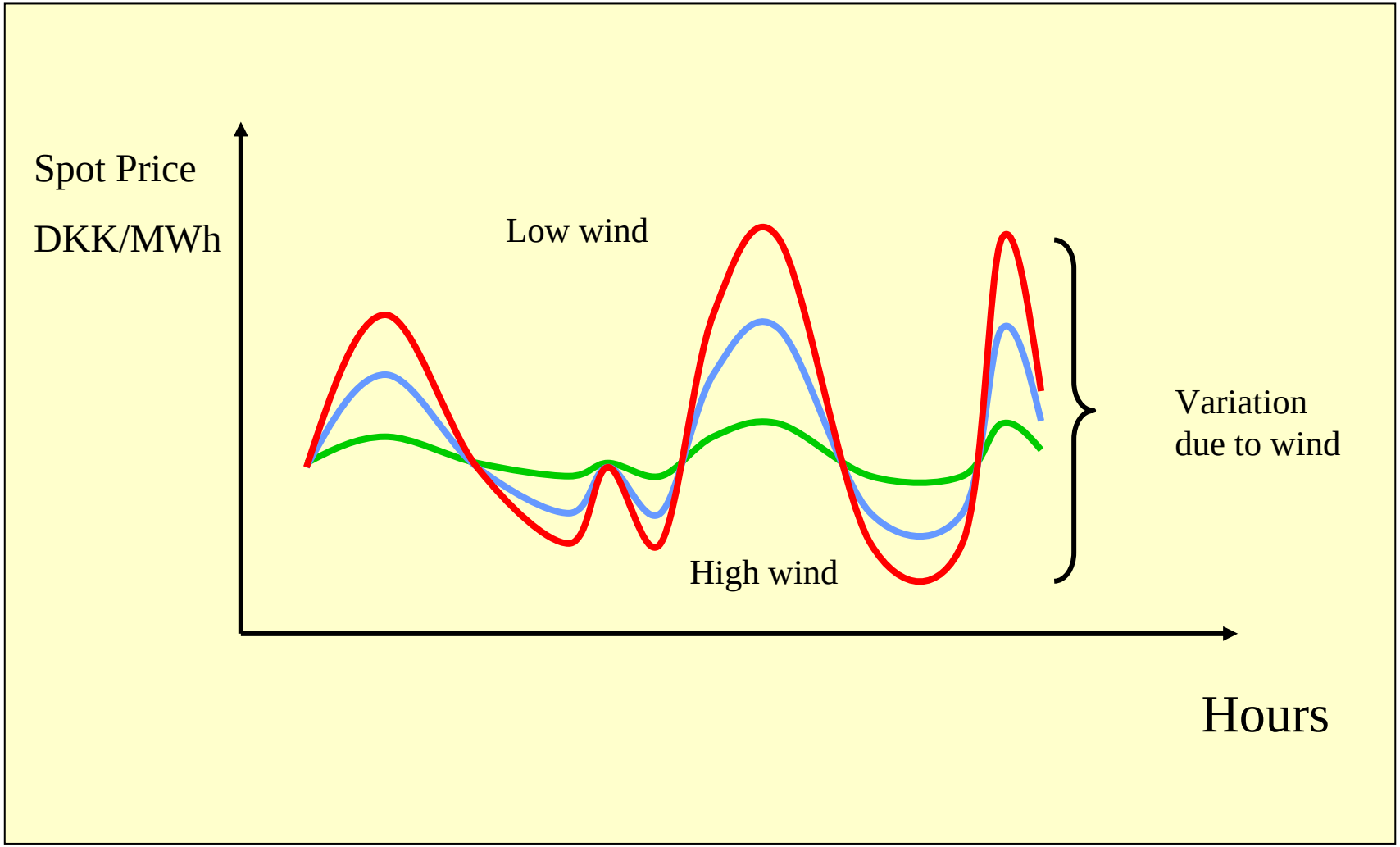
Wind Power and Spot Prices – at present



Wind Power and Spot Prices – high penetration of wind power



Wind Power and Spot Prices – very high penetration of wind power

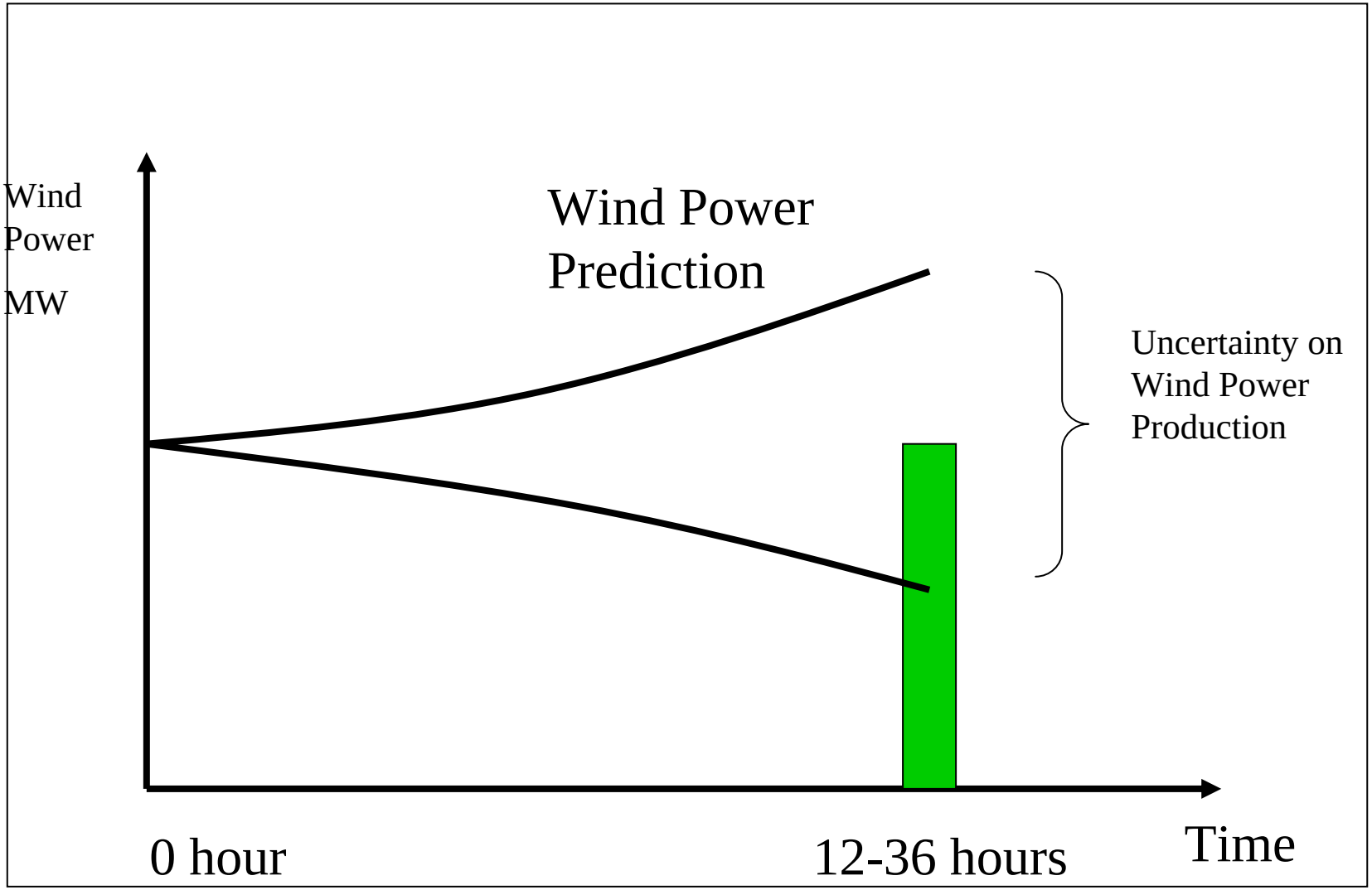


A Market Problem?

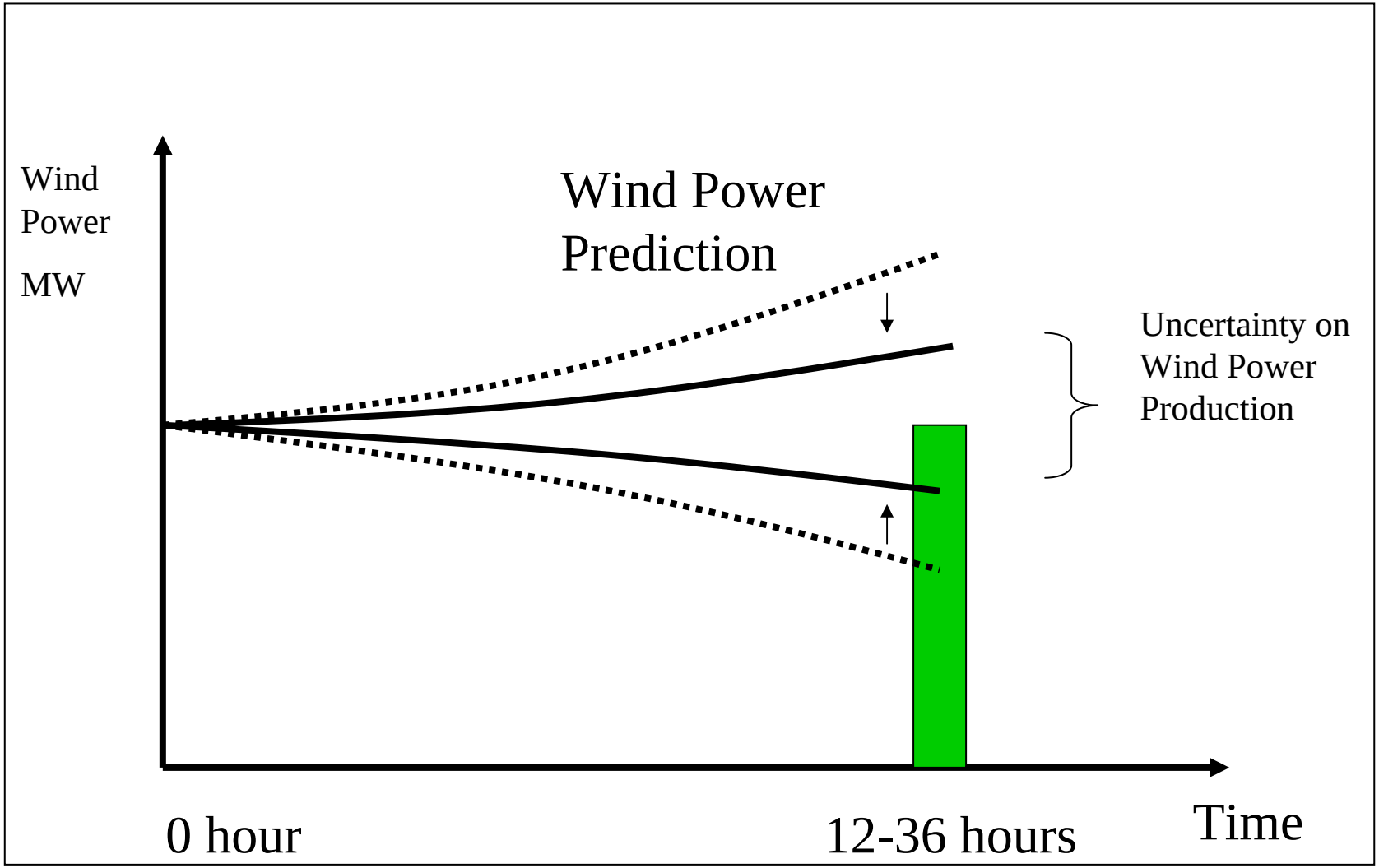
Will the market initiate the necessary investments in new capacity and storage facilities?

- More transmission capacity to other countries
- New domestic capacity, preferably fast reacting natural gas combined cycle plants or gas turbines
- Medium term storage facilities (batteries, hydrogen etc.)
- Medium term possibilities for switching off power consumption at selected locations

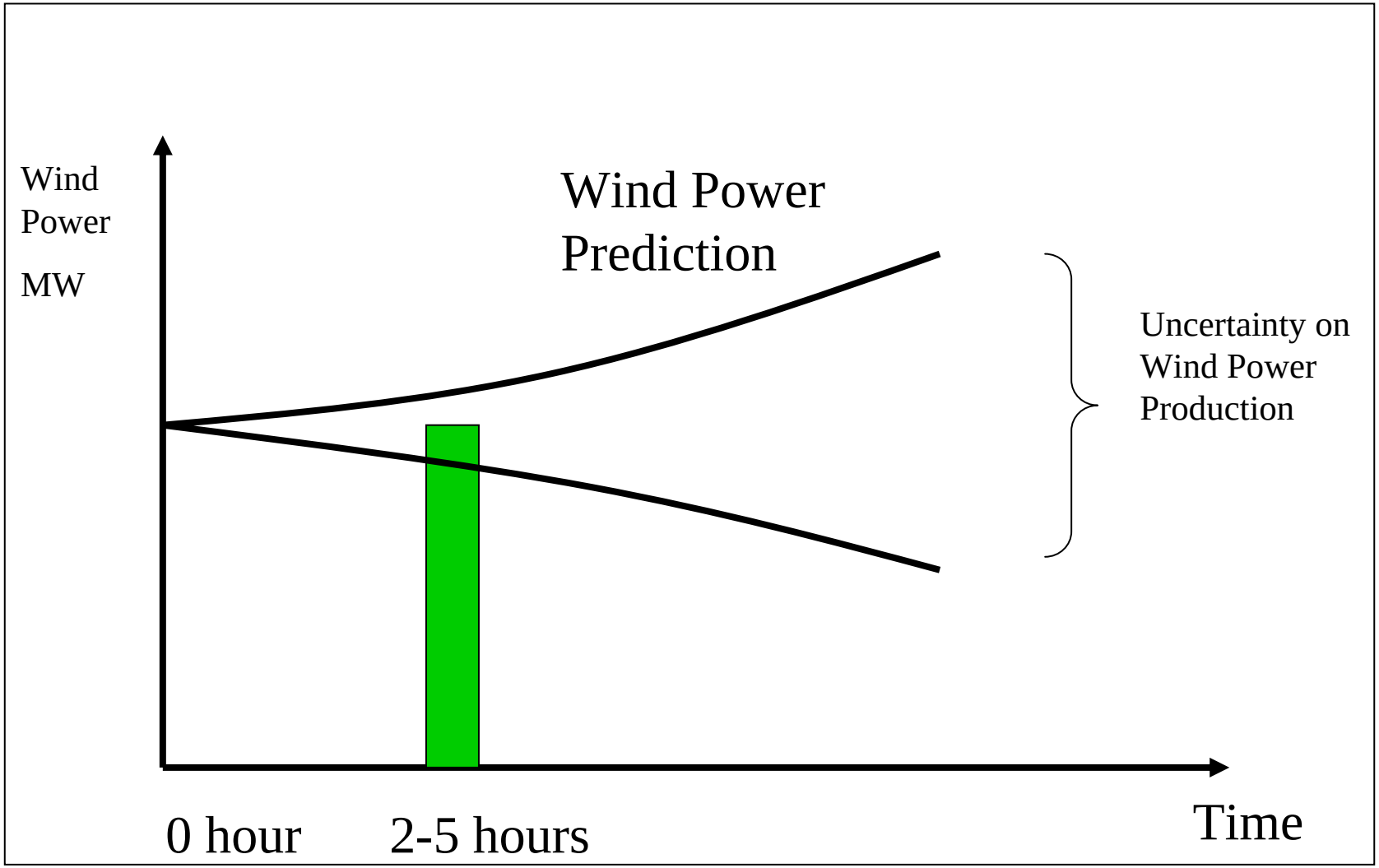
The Importance of Wind Power Fulfilling its Bid



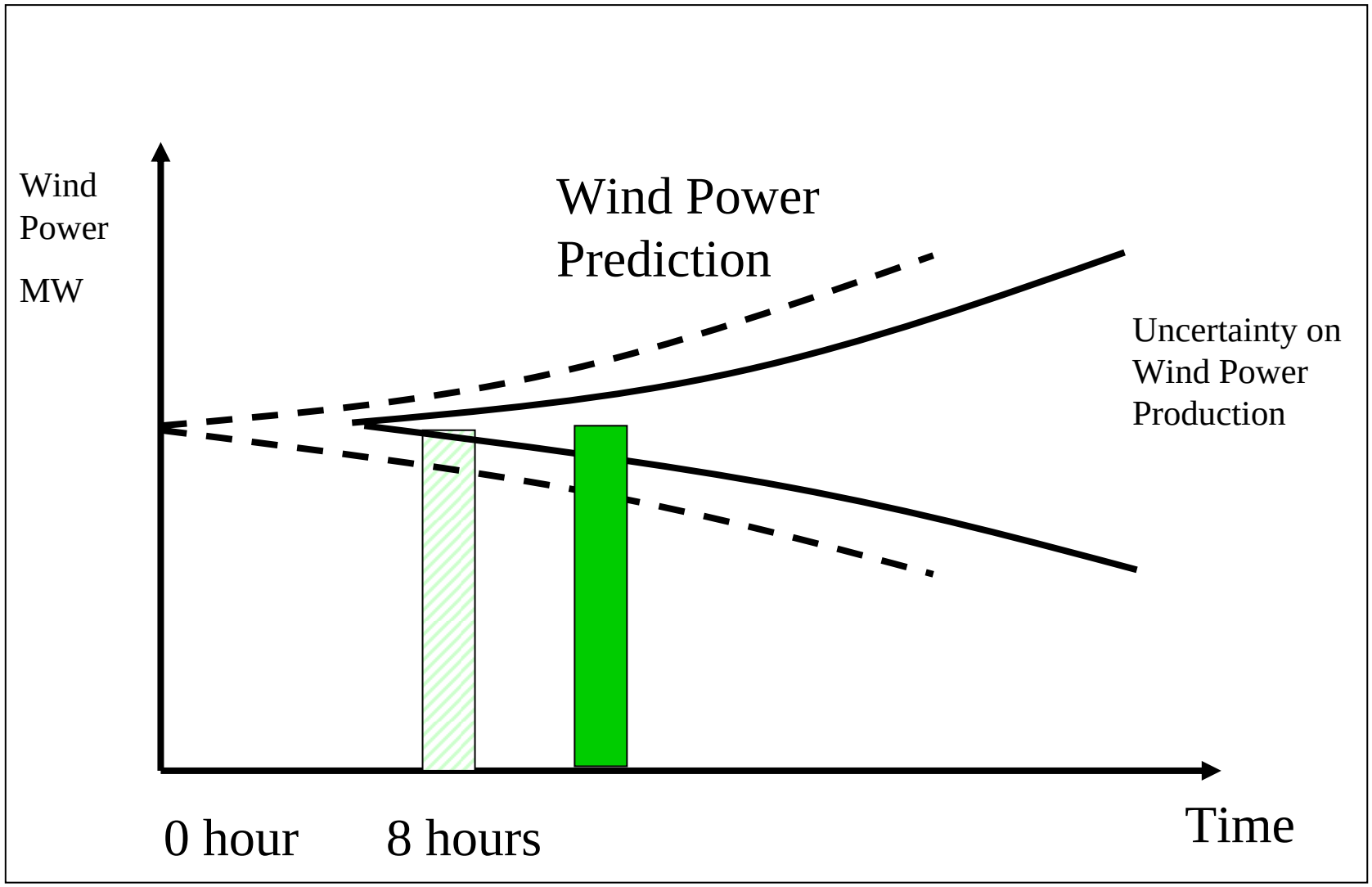
Better Predictions



Shorter bidding periods



Continuously bidding



Conclusions

- **Wind power is going to be a significant part of the future energy system**
  - 1% of Global electricity consumption today – 25% in 2050
- **Price volatility on fuel markets might increase the risk premium for investments in wind power in the short term**
- **Electricity markets are not developed to technologies with variable output**
  - In the longer term new market designs could improve the integration of wind power